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Docket No. 2328-050A PATENT

THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	
Inventors: Jian J. CHEN et al.	:
	:
U.S. Patent Application No. 10/647,347	: Group Art Unit: 1763
:	
Filed: March 12, 2007	: Examiner: Luz L. ALEJANDRO MULERO
:	
For: INDUCTIVE PLASMA PROCESSOR METHOD	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Attn: BOARD OF PATENT APPEALS AND INTERFERENCES

BRIEF ON APPEAL

Further to the Notice of Appeal filed February 1, 2007, in connection with the above-identified application on appeal, herewith is Appellant's Brief on Appeal. The Commissioner is authorized to charge Deposit Account No. 07-1337 in the amount of $500 for the statutory fee.

To the extent necessary, Appellant hereby requests any required extension of time under 37 C.F.R. §1.136 and hereby authorizes the Commissioner to charge any required fees not otherwise provided for to Deposit Account No. 07-1337.

CERTIFICATION OF FACSIMILE TRANSMISSION
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Serial No. 10/777,174

I. Real Party in Interest

The real party in interest is Lam Research Corporation.

II. Related Appeals and Interferences

There are no pending related appeals and/or interferences; the parent application, serial number 09/821,027, was involved in Appeal 2005-1046.

III. Status of Claims

A. Total Number of Claims in Application

1. There are 10 claims pending in the application, which are identified as claims 32-41.

B. Status of all the claims

1. Claims canceled: 1-31, many of which were prosecuted in the parent application, now US patent 7,096,819.

2. Claims withdrawn from consideration but not canceled: none.

3. Claims pending: 32-41.

4. Claims allowed: none.

5. Claims rejected: 32-41.

C. Claims on Appeal

1. Claims on appeal: claims 32-41.

IV. Status of Amendments

The amendment after Final Rejection was entered.

V. Summary of Claimed Subject Matter

Claim 32 is concerned with a method of manufacturing many different inductive plasma processors of the same type (title, page 32, lines 15, 22, 23) wherein each of the processors includes a plasma excitation coil having plural electrically connected windings 40, 42; (page 16, line 5; page 32, lines 15, 16; fig. 2). Each of the windings 40, 42 has a pair of excitation terminals, so that winding 40 includes terminals 46, 48 and winding 42 includes terminals 50, 52 (page 16, lines 9-11). The windings 40, 42 of the coil of each processor are adapted to be driven by excitation source arrangement 26 so that different currents simultaneously flow through the pair of excitation terminals 46, 48, 50 and 52 of windings 40, 42 (page 16, lines 6-8). The windings 40, 42 of each coil 24 of each processor are arranged so exterior winding 40 is about interior winding 42 (page 16, lines 8, 9). The exterior winding 40 and the interior winding 42 are about coil axis 44 (page 16, lines 5, 6).

The different processors of the same type have differing electric field and plasma density distributions from processor to processor (page 32, lines 22- page 33, line 1). For each of the inductive plasma processors, the method comprises moving the position of the exterior and interior windings 40, 42 relative to each other and axis 44 so the plasma density incident on a workpiece 32 (page 15, line 28) in a chamber 10 (Fig. 1, page 12, lines 12, 13) of the processor has a predetermined desired relationship until tests conducted on each processor indicate optimum uniform plasma distribution is achieved in each processor (page 32, lines 15-18; page 32, lines 22 – page 33, line 3).

Claim 33 depends on claim 32 and indicates the different processors of the same type have differing azimuthal electric field distributions (page 32, lines 22, 23). In this case, movement of the exterior and interior windings 40, 42 relative to each other includes turning the windings 40, 42 relative to each other and axis 44 until the tests indicate the different processors of the same type have the optimum uniform plasma distribution (page 32, line 22 – page 33, line 3; page 32, line 17).

Dependent claim 34 requires the method of claim 33 to be performed on coils of a processor having windings 40, 42 electrically connected in parallel (page 17, line 6).

Claim 35 indicates the tests of claim 32 are conducted by simultaneously supplying electric current to the excitation terminals 46, 48, 50, 52 of windings 40, 42 of the coil of a particular processor (page 17, lines 6, 7, lines 18-20).

Independent claim 36 defines a method of controlling the plasma flux distribution on a workpiece 32 of an inductive plasma processor (title) including a plasma excitation coil 24 having plural electrically connected windings 40, 42. Each of the windings has a pair of excitation terminals so winding 40 includes terminals 46, 48 and winding 42 includes terminals 50, 52. Windings 40, 42 are adapted to be driven by an excitation source arrangement including RF source 26 so that different currents simultaneously flow though the excitation terminals 46, 48, and 50, 52 windings 40 and 42 respectively of a coil 32 (page 16, lines 6-8) of a particular processor (page 16, lines 6-8). The exterior and interior windings 40, 42 are about axis 44 of the coil (page 16, lines 5, 6).

The method is performed on several (i.e., three or more) different processors of the same type having different azimuthal electric field and plasma density distribution from processor to processor (page 32, line 15, page 32, line 22 – page 33, line 1). The method comprises changing the relative angular position between the exterior and interior windings 40, 42 of the coil so the plasma density distribution incident on workpiece 24 has a predetermined desired relationship (page 32, lines 22 – page 33, lines 3). The angular position changing step includes turning the exterior and interior windings 40, 42 of the coil relative to each other about axis 44 (page 32, lines 15 – 18). The exterior and interior windings 40, 42 are turned relative to each other to assist in controlling azimuthal electric field distribution and plasma density distribution of the processor (page 32, lines 13-28). The exterior and interior windings 40, 42 of each particular processor are turned relative to each other until tests indicate optimum uniform plasma distribution is achieved in each processor (page 33, lines 1-3).

Claim 37, that depends on claim 36, adds the same limitations to claim 36 that claim 34 adds to claim 32.

Claim 38, that depends on claim 36, adds the same limitations to claim 35 that claim 35 adds to claim 32.

Independent claim 39 is similar to independent claim 36. The method is performed on several (i.e., three or more) different processors of the same type having different azimuthal electric field and plasma density distribution from processor to processor (page 32, line 15, page 32, line 22 – page 33, line 1). Claim 39 states the relative position between the exterior and interior windings (40, 42) of the coil is

changed so the plasma density incident on workpiece 24 has a predetermined desired relationship (page 32, line 22 – page 33, line 3). The position changing step includes moving the exterior and interior windings 40, 42 of the coil relative to each other (page 32, lines 15-17). The exterior and interior windings 40, 42 are moved relative to each other to assist in controlling electric field distribution and plasma density distribution of the processor (page 32, lines 15-22). The exterior and interior windings 40, 42 of each particular processor are moved relative to each other until tests indicate optimum uniform plasma distribution is achieved in each processor (page 32, line 22 – page 33, line 3).

Claim 40, that depends on claim 39, adds the same limitations to claim 39 that claim 34 adds to claim 32.

Claim 41, that depends on claim 39, adds the same limitations to claim 39 that claim 35 adds to claim 32.

VI. Grounds of Rejection to be Reviewed on Appeal

A. The rejection of claims 32-41 under 35 U.S.C. 103(a) as being unpatentable over Ishii et al., U.S. Patent 5,795,429 in view of Yoshida et al., U.S. Patent 5,690,781 and Savas, U.S. Patent 5,983,828 is wrong.

B. The rejection of claims 32-41 under 35 U.S.C. 103(a) as being unpatentable over Ishii et al., U.S. Patent 5,795,429 in view of Ni et al., WO 00/58993 and Savas, U.S. Patent 5,983,828 is wrong.

C. The rejection of claims 32-41 under 35 U.S.C. 103(a) as being unpatentable over Chen et al., U.S. Patent 6,164,241 in view of Yoshida et al., U.S. Patent 5,690,781 and Savas, U.S. Patent 5,983,828 is wrong.

D. The rejection of claims 32-41 under 35 U.S.C. 103(a) as being unpatentable over Chen et al., U.S. Patent 6,164,241 in view of Ni et al, WO 00/58993 and Savas, U.S. Patent 5,983,828 is wrong.

E. The rejection of claims 32-41 under 35 U.S.C. 103(a) as being unpatentable over Lee et al., U.S. Patent 6,288,493 in view of Yoshida et al., U.S. Patent 5,690,781 and Savas, U.S. Patent 5,983,828 is wrong.

F. The rejection of claims 32-41 under 35 U.S.C. 103(a) as being unpatentable over Lee et al., U.S. Patent 6,288,493 in view of Ni et al., WO 00/58993 and Savas, U.S. Patent 5,983,828 is wrong.

VII. Argument

A. The Problem Solved By The Claimed Method

Plasma processors of the same type typically have differing electric field and plasma density distributions from processor to processor. This is because of anomalies from processor to processor. The anomalies can be due to various reasons, such as variations in the (1) components of the processors, at the time of processor fabrication and assembly, and/or (2) operating conditions in different environments having differing ambient magnetic fields that affect the magnetic fields of processors having coils that produce magnetic and electric fields. Typical prior art

plasma processors having coils were not well equipped to handle this problem. The typical prior art coils were manufactured on a prescribed basis, having a fixed geometry that was not subject to change while the coil was manufactured and/or installed in the processor.

The prior art relied on by the Examiner fails to consider this problem. It is also not concerned with a method of manufacturing many different plasma processors, as independent claim 32 requires, or a method that is performed on several (i.e. three or more) processors of the same type having differing electric field and plasma distributions from processor to processor, as claims 36 and 39 require.

B. The three different primary references

1. Ishii et al., USP 5,795,429

Figure 9 of Ishii et al., the figure relied upon by the Examiner in the Final Rejection, discloses the structure of a plasma processor having a coil including two spiral windings or antennae 24A and 24B, connected to be responsive to two different AC sources 28A and 28B, respectively. Winding 24A is concentric with winding 24B, and surrounds winding 24B. Ishii et al. has no disclosure of windings 24A and 24B being moved relative to each other, no less being moved until tests indicate optimum uniform plasma distribution is achieved in each of many or several processors, as independent claims 32 and 39 require. Further, there is no disclosure in Ishii et al of the requirement of claims 33 and 36 for winding 24A to be turned relative to winding 24B, no less being turned to assist in controlling azimuthal electric field distribution and azimuthal plasma density distribution of the processor. Ishii et al. also has no

disclosure of the requirement of claim 36 for the method to be performed on several different processors of the same type having differing azimuthal electric field and plasma density distributions from processor to processor, such that the exterior and interior windings of each particular processor are turned relative to each other until tests indicate optimum uniform plasma distribution is achieved in each processor. There is no reason to assume that windings 24A and 24B of Ishii et al. are anything but fixed.

2. Chen et al., USP 6,164,241

Chen et al., commonly assigned and co-invented by the inventors of the present application, is relied on by the Examiner for the disclosure in Figure 6. Figure 6 discloses coil 1 and coil 2, which are more accurately considered to be windings and are concentric with each other and are connected in parallel to an RF source. Each of coils 1 and 2 has an input excitation terminal connected to the RF source by a separate capacitor, such that coil 1 and coil 2 are respectively connected to the RF source by capacitors C_1 and C_2. Each of the coils is also connected to ground by a capacitor, so that a terminal of coil 1 opposite from the coil connected to capacitor C_1 is connected to ground by capacitor C_3 and the terminal of coil 2 opposite from the terminal connected to capacitor C_2 is connected to ground by capacitor C_4.

The description of Figure 6, at column 9, lines 23-column 10, line 15, indicates the values of capacitors C_1-C_4 can be adjusted to adjust the current distribution in the coils. In addition, this portion of the Chen et al. reference indicates it is possible to reverse the angular position of coil 1 relative to coil 2 by providing a configuration